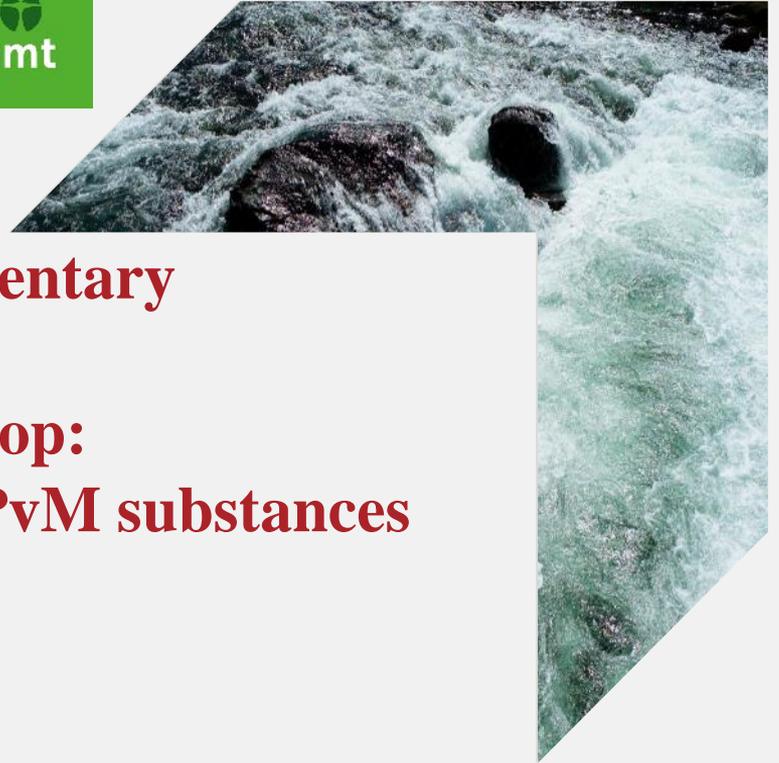




Umwelt
Bundesamt



**Poll results and Commentary
from the
Third PMT workshop:
Getting Control of PMT and vPvM substances
under REACH**

Hans Peter H. Arp

25'th – 26'th March, 2021

Poll results and commentary

Contact: hpa@ngi.no

Poll # 1: What are the most important gaps for PMT substances ? (Please pick 3)

Timepoint: Start of workshop

Substance Assessment

- ↴ Availability of Persistency data?
- ↴ Availability of Mobility data?
- ↴ Availability for Toxicity data?
- ↴ Availability of Analytical methods?
- ↴ Availability of Monitoring data?
- ↴ Availability of transformation products and mixture composition?

Risk Governance

- ↴ Missing risk assessment tools/models?
- ↴ Missing water remediation infrastructure?
- ↴ Missing chemical legislation?
- ↴ Missing safe and sustainable substitutes?



Results of Poll #1*

1. Availability of transformation products and mixture composition? (**48%**)
2. Availability of analytical methods? (**44%**)
3. Availability of monitoring data? (**37%**)
4. Missing safe and sustainable substitutes? (**29%**)
5. Missing risk assessment tools/models? (**28%**)
6. Missing chemical legislation? (**26%**)
7. Availability for toxicity data? (**24%**)
8. Availability of mobility data? (**21%**)
9. Availability of persistency data? (**19%**)
10. Missing water remediation infrastructure? (**15%**)

- * ↗ Data corrected for number of unique respondents,
- ↗ Ignores «no response» and double responses
- ↗ n=336 workshop participants responded
- ↗ (ca 166 attendants with no response)

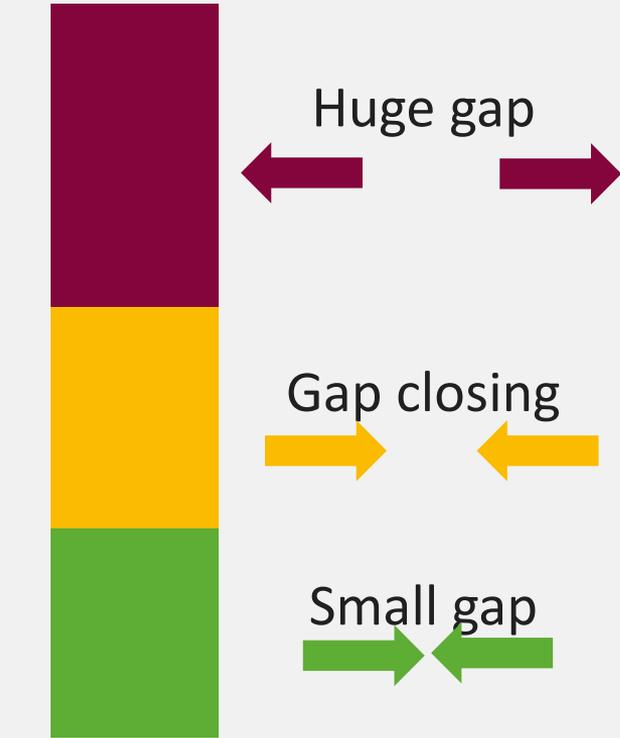


Commentary on poll # 1 (beginning of workshop)

- ↯ There was a wide spread in opinion, with 15% to 48% of each individual gap being selected as one of the top three gaps.
- ↯ “Availability of transformation products and mixture composition” was the biggest gap, with 48% of respondents putting this in their top three.
- ↯ This was followed by “Availability of analytical methods” (number 2) and “Availability of monitoring data” (number 3) data gaps. In some ways these are linked to each other, as you cannot monitor if no analytical methods are there, and you often analytical methods are not developed until there is a monitoring indication. Further the transformation product/mixture gap is also related, as transformation and mixtures can make a large amount of «unknowns» in monitoring campaigns, and also represent an «unknown» chemicals to look for, as often structures are missing.
- ↯ Information about P, M and T properties was ranked low (gaps 7-9)
- ↯ Risk governances gaps were in the middle (ranked 4-6) including the availability of appropriate risk assessment models, safe and sustainable substitutes, and chemical legislation. What is interesting in this regard as these gaps in risk governance require information on P, M and T substance properties, as well as information on all other gaps.
- ↯ “Missing water treatment infrastructure” was ranked as the smallest gap, could this mean at the audience felt that water treatment infrastructure is sufficient?

- ↯ As will be presented in the results of the next poll at the end of the workshop, there was a huge shift in the opinion of gaps, in part due the workshop giving a better understanding of the state-of-the art and providing a clearer definition of the gaps.

Poll # 2: What is the SIZE of the gaps for PMT substances ? Pick «huge», «closing» or «small»
Timepoint: End of workshop



- For the same gaps as the first poll, we presented the first glimpse at new project results and a summary of the workshop in relation to each “gap”
- *Then at the end of the presentation, the audience was given 20 minutes if they think each gap is huge, closing or small*
- Hans Peter **made a prediction of audience response** before the polls were open. This was not necessarily Hans Peter’s personal opinion, but how he anticipated the audience would respond by the end of the workshop.
- **The slides below compare Hans Peter’s prediction of audience poll with the audience polling, and also of the first poll**

Gap 1: Availability of Persistence data? Prediction

HPA's prediction

-
-
-

40%

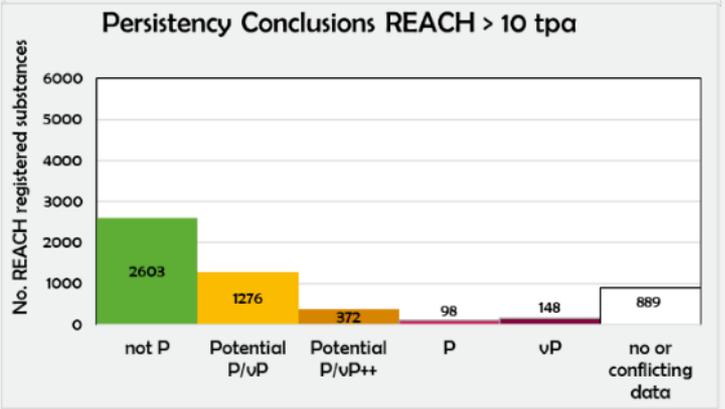
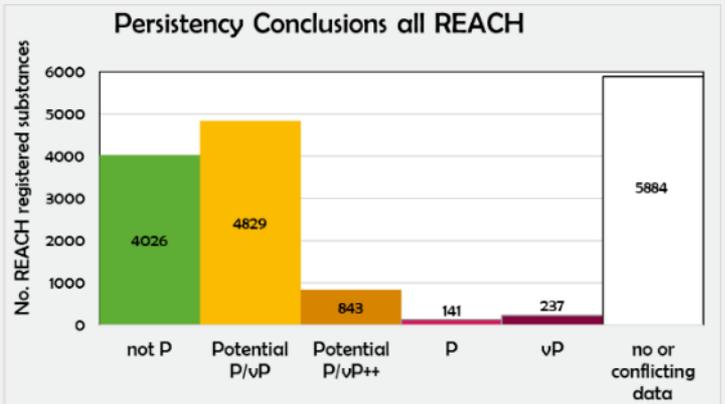
40%

20%

Little/no information for low volume/intermediate REACH substances

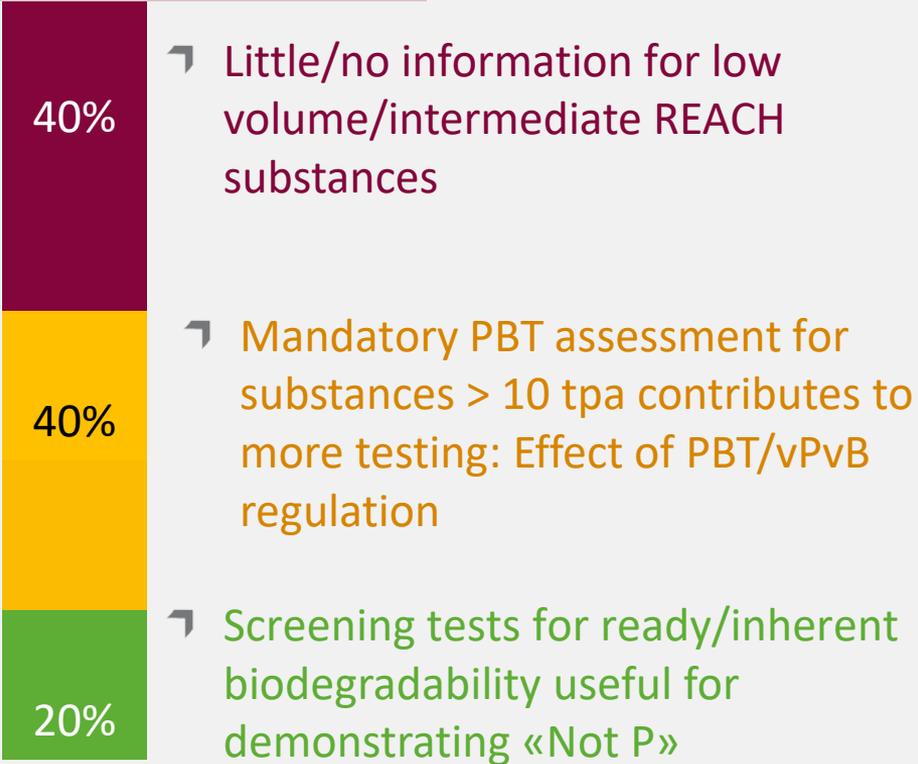
Mandatory PBT assessment for substances > 10 tpa contributes to more testing: Effect of PBT/vPvB regulation

Screening tests for ready/inherent biodegradability useful for demonstrating «Not P»

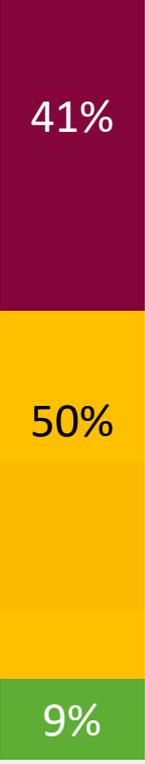


Gap 1: Availability of Persistency data? Results

HPA's prediction



Audience



HPA commentary:
Very close match!

Gap 2: Availability of Mobility data? Prediction

HPA's prediction

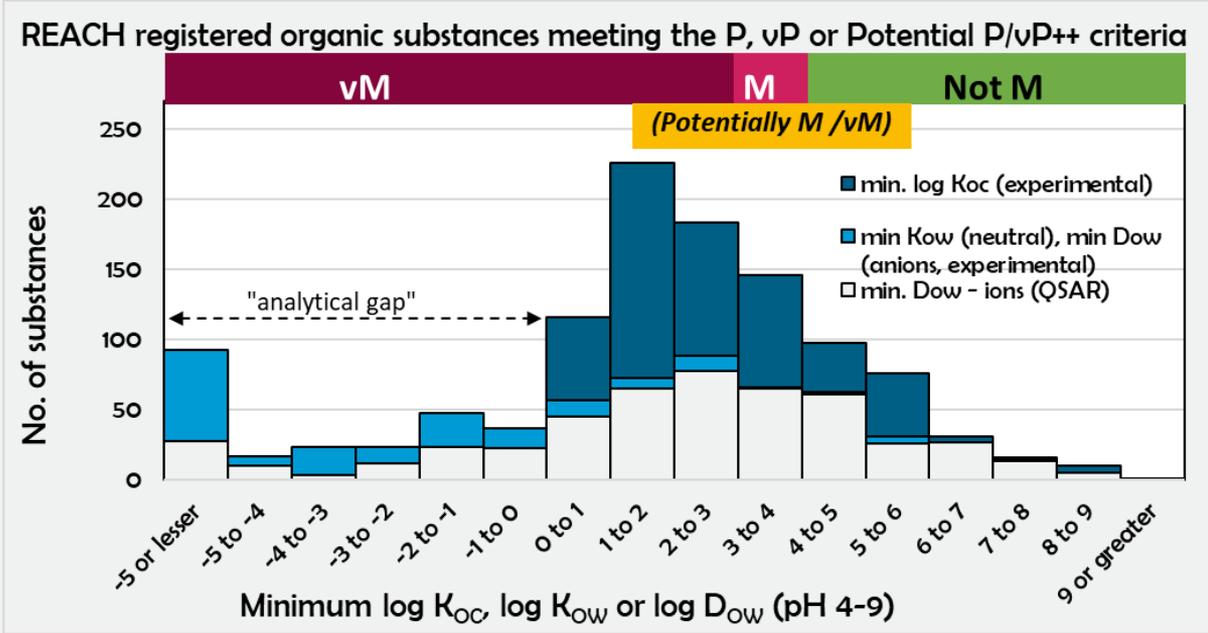
20%

20%

60%

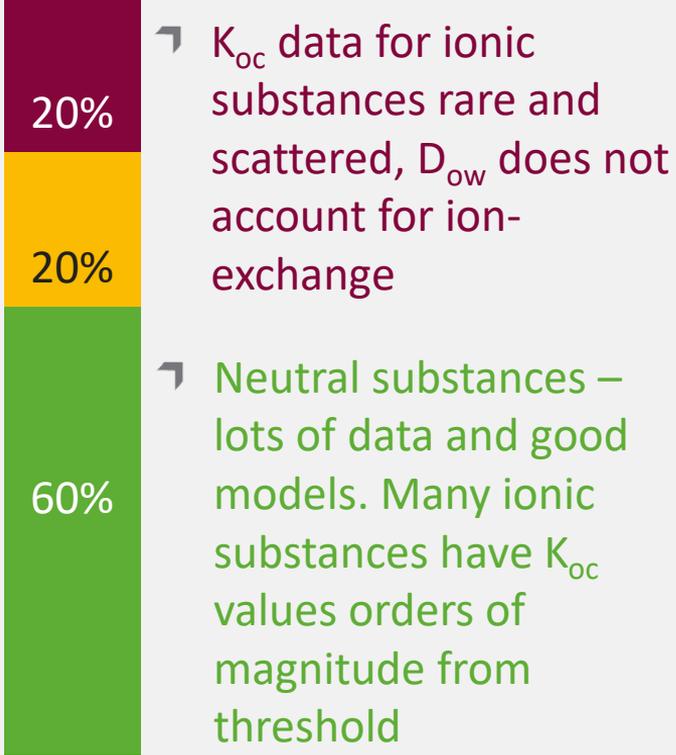
↗ K_{oc} data for ionic substances rare and scattered, D_{ow} does not account for ion-exchange

↗ Neutral substances – lots of data and good models. Many ionic substances have K_{oc} values orders of magnitude from threshold



Gap 2: Availability of Mobility data? Results

HPA's prediction



Audience



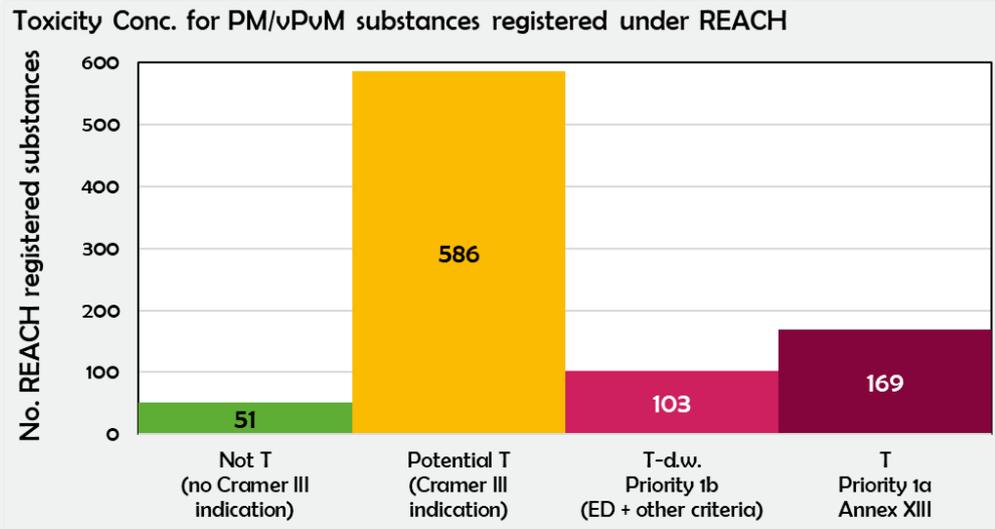
HPA commentary:

Count as a miss: I thought the audience would be more convinced that the mobility data available is a minor/closing gap. I agree for a fraction of ionic substances this is a huge gap, but for the majority of substances I am not concerned.

Gap 3: Availability of Toxicity data? Prediction

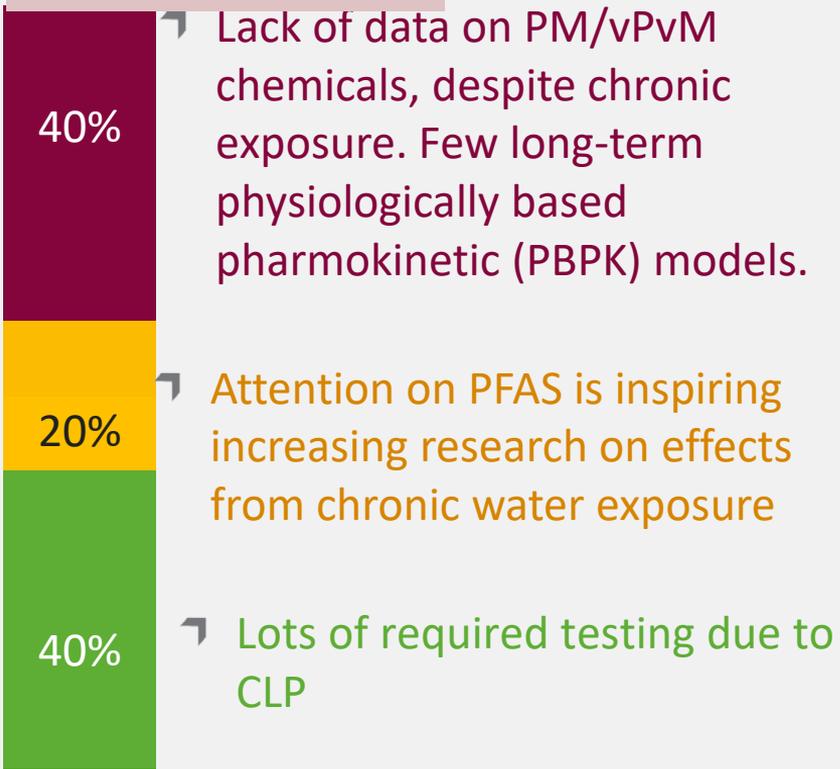
HPA's prediction

- 40% ↗ Lack of data on PM/vPvM chemicals, despite chronic exposure. Few long-term physiologically based pharmacokinetic (PBPK) models.
- 20% ↗ Attention on PFAS is inspiring increasing research on effects from chronic water exposure
- 40% ↗ Lots of required testing due to CLP

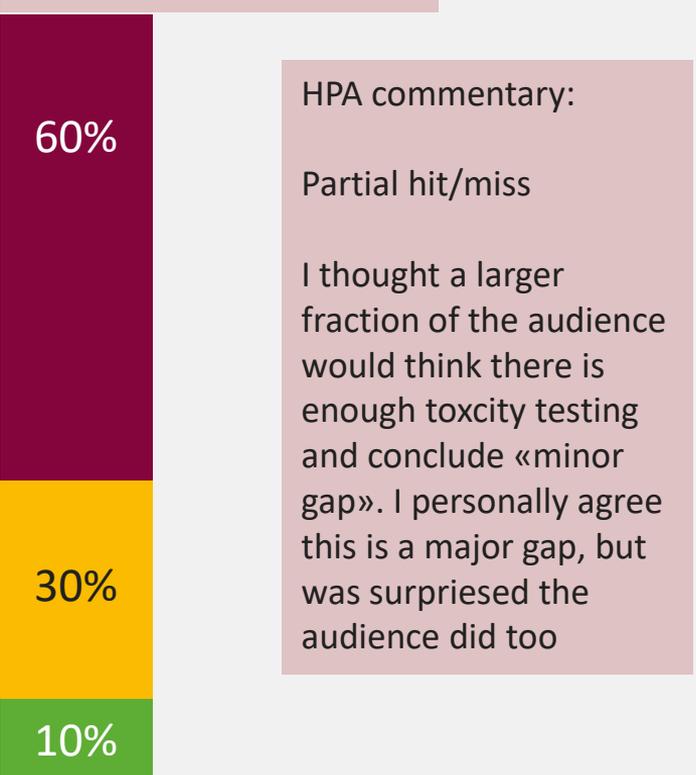


Gap 3: Availability of Toxicity data? Results

HPA's prediction



Audience



Gap 4: Availability of Analytical methods? Prediction

HPA's prediction

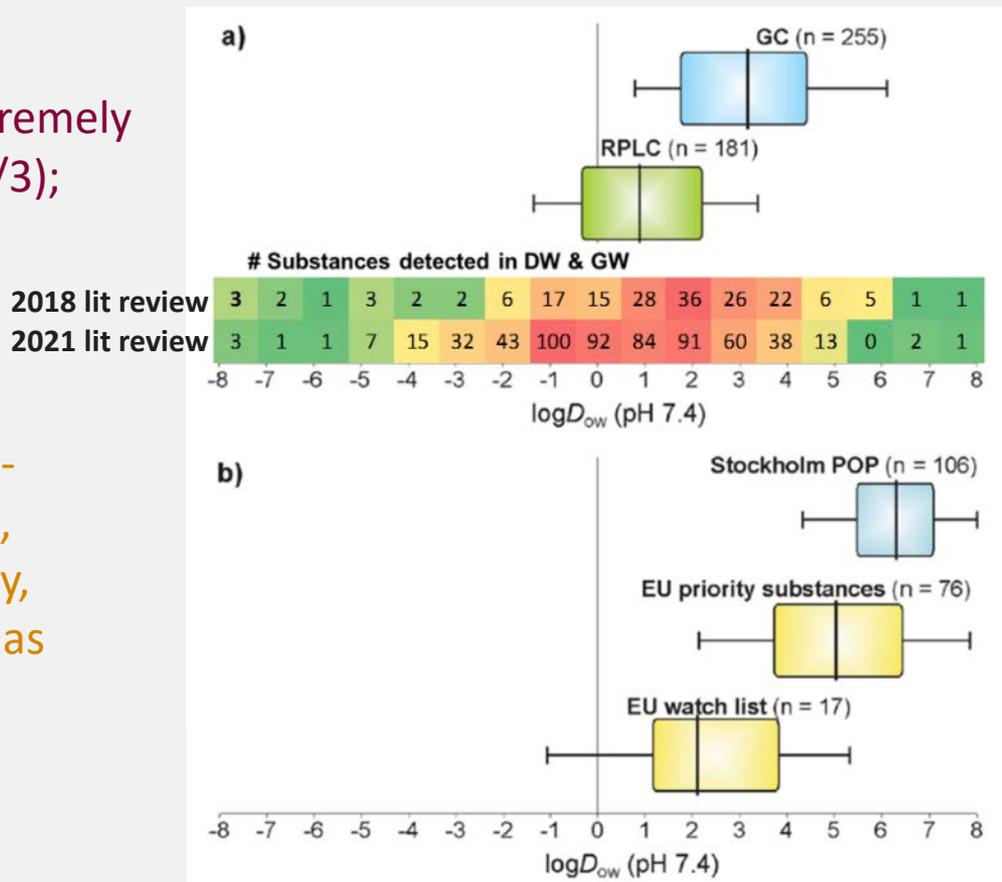
30%

Target analysis still needed for extremely mobile substances (e.g. $\log D < -2/3$); standards HARD to come by

40%

VAST improvements in the past 5 years in relation to target and non-target analysis (e.g. HILIC columns, Super critical fluid chromatography, suspect screening databases such as the Norman Network SLE)

30%



Gap 4: Availability of Analytical methods? results

HPA's prediction

30%

Target analysis still needed for extremely mobile substances (e.g. $\log D < -2/3$); standards HARD to come by

40%

VAST improvements in the past 5 years in relation to target and non-target analysis (e.g. HILIC columns, Super critical fluid chromatography, suspect screening databases such as the Norman Network SLE)

30%

Audience

33%

HPA commentary:

Very close prediction!

57%

Though I thought a somewhat larger portion of the audience would say there was «no analytical gap» as we have so many great methods out there.

11%

Gap 5: Availability of Monitoring Data? Prediction

HPA's prediction

70%

↗ An **incentive** gap: why monitor unless requested/share data unless requested. Only seeing tip of the «chemical iceberg» via research community

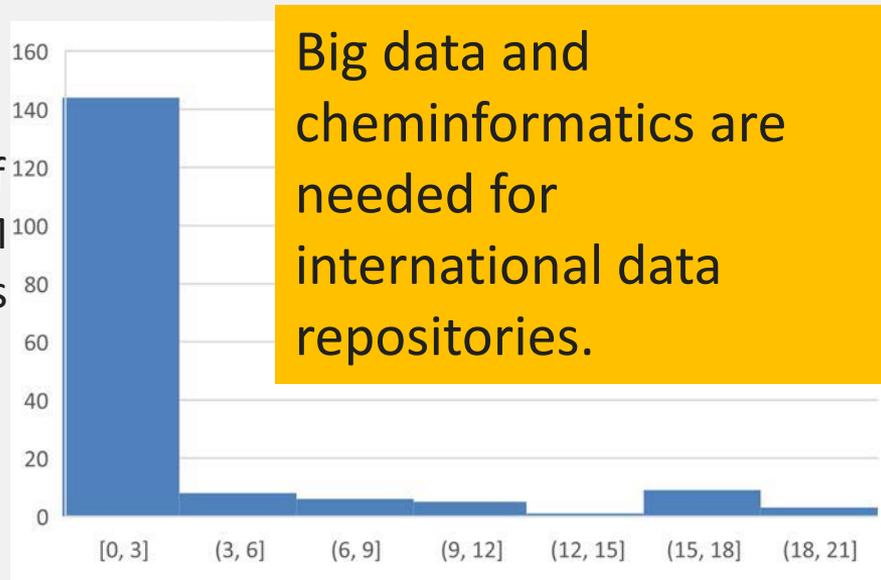
20%

↗ State-of-the-art research labs paving the way!

10%

NGI

Number of PMT/vPvM substances



Number of water analysis labs in Germany that routinely analyze for them

Gap 5: Availability of Monitoring Data? Results

HPA's prediction

70%

↗ An **incentive** gap: why monitor unless requested/share data unless requested. Only seeing tip of the «chemical iceberg» via research community

20%

↗ State-of-the-art research labs paving the way!

10%

NGI

Audience

64%

32%

4%

HPA commentary:

A very close prediction!

Gap 6: Transformation products and mixture composition? (Results)

HPA's prediction

↗ For all REACH:

- ↗ ONLY 451 transformation products identified through **experimental** databases (EAWAG BBD, Norman SLE)
- ↗ QSARs give multiple predictions (see Zheng et al.)
- ↗ Ca 30% of organic substances in REACH are complex mixtures (UVCBs)

80%

10%

10%

NGI

Audience

91%

7%

2%

HPA commentary:

Another very close prediction, and maybe the least surprising one.

Gap 7: Missing risk assessment tools/models? Prediction

HPA's prediction

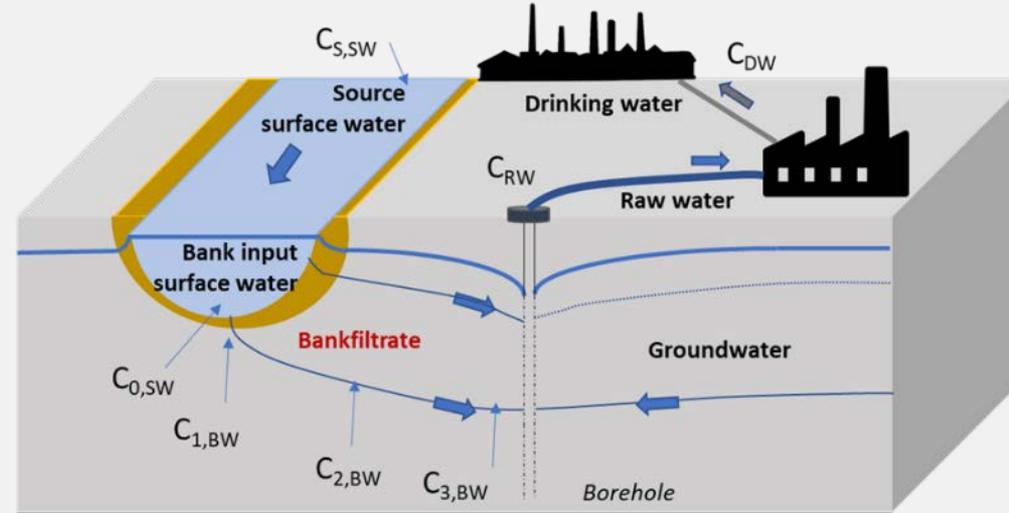
60%

- Mobility gap – ionic substances have complex behaviour
- Toxicity gap – unknown long term exposure effects
- Diffuse emissions, bank filtrate/ground water are inherently complex and not covered by generic models

10%

30%

- Well established agriculture plant protection product (PPP) and waste water treatment plant (WWTP models for specific scenarios (EUSES, SimpleTreat)



Gap 7: Missing risk assessment tools/models? Results

HPA's prediction

60%

- ↗ Mobility gap – ionic substances have complex behaviour
- ↗ Toxicity gap – unknown long term exposure effects
- ↗ Diffuse emissions, bank filtrate/ground water are inherently complex and not covered by generic models

10%

30%

- ↗ Well established agriculture plant protection product (PPP) and waste water treatment plant (WWTP) models for specific scenarios (EUSES, SimpleTreat)

Audience

34%

53%

10%

HPA commentary:

I will call this a miss prediction, as clearly more of the audience though risk assessment tools were adapting to PMT/vPvM substances than I did. Personally I still think the gap is quite large, as it represents the sum of many gaps (e.g. emissions, M, T)

Gap 8: Missing water remediation infrastructure? (rank 10)

HPA's prediction

70%

- ↗ **A gap that cannot be fully closed.** Many “pristine”, or developing countries have limited drinking water production infrastructure – rely on chemical regulation to ensure protection.

20%

- ↗ **Regrettable remediation:** Most PMT/vPvM only removable with RO / super expensive, resource intensive treatment: Economic, Efficiency and Sustainability concerns.

10%

- ↗ **Advance treatment methods work best at emission source**

Screening of 158 PMT/vPvM substances Arp and Hale 2019. Suitable water treatments:

Setting the agenda in research

Comment



One of five water-reuse plants in Singapore, which together supply about 40% of the nation's water for drinking and other uses.

Drink more recycled wastewater

Cecilia Tortajada and Pierre van Rensburg

Technique	%
Neither O ₃ nor AC	52,5
Only O ₃	15,8
Only AC	20,9
Both	10,8

K.Nödler, preliminary results

Tortajada and van Rensburg, Nature, 2019

Gap 8: Missing water remediation infrastructure? Prediction

HPA's prediction

70%

↗ **A gap that cannot be fully closed.** Many “pristine”, or developing countries have limited drinking water production infrastructure – rely on chemical regulation to ensure protection.

20%

↗ **Regrettable remediation:** Most PMT/vPvM only removable with RO / super expensive, resource intensive treatment: Economic, Efficiency and Sustainability concerns.

10%

↗ **Advance treatment methods work best at emission source**

Audience

56%

20%

13%

HPA commentary:

I will call this a good prediction, especially considering in the first poll the audience did not see water remediation as a major gap, but I think day 1 (especially) convinced them that it was.

Gap 9: Missing chemical legislation? Prediction

HPA's prediction

30%

- ↗ Harmonization to be explored across risk and hazard based legislation and regulation (CLP, REACH, PPPR, WHO GV, DWD, E-PRTR)

50%

The Chemicals Strategy for Sustainability and Zero Pollution Ambition

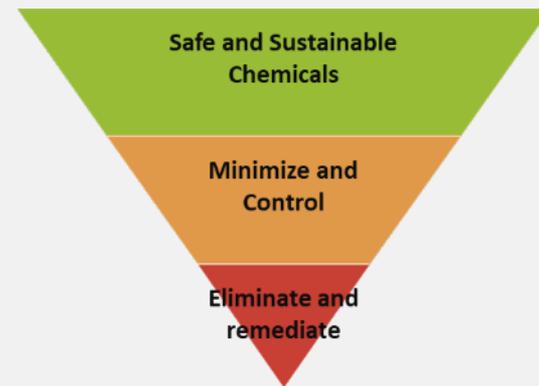
- ↗ Inclusion of PMT/vPvM in for REACH / CLP
- ↗ PFAS restriction
- ↗ Safe and Sustainable by Design

20%

- ↗ Existing tools
 - ↗ Article 57f
 - ↗ PPPR

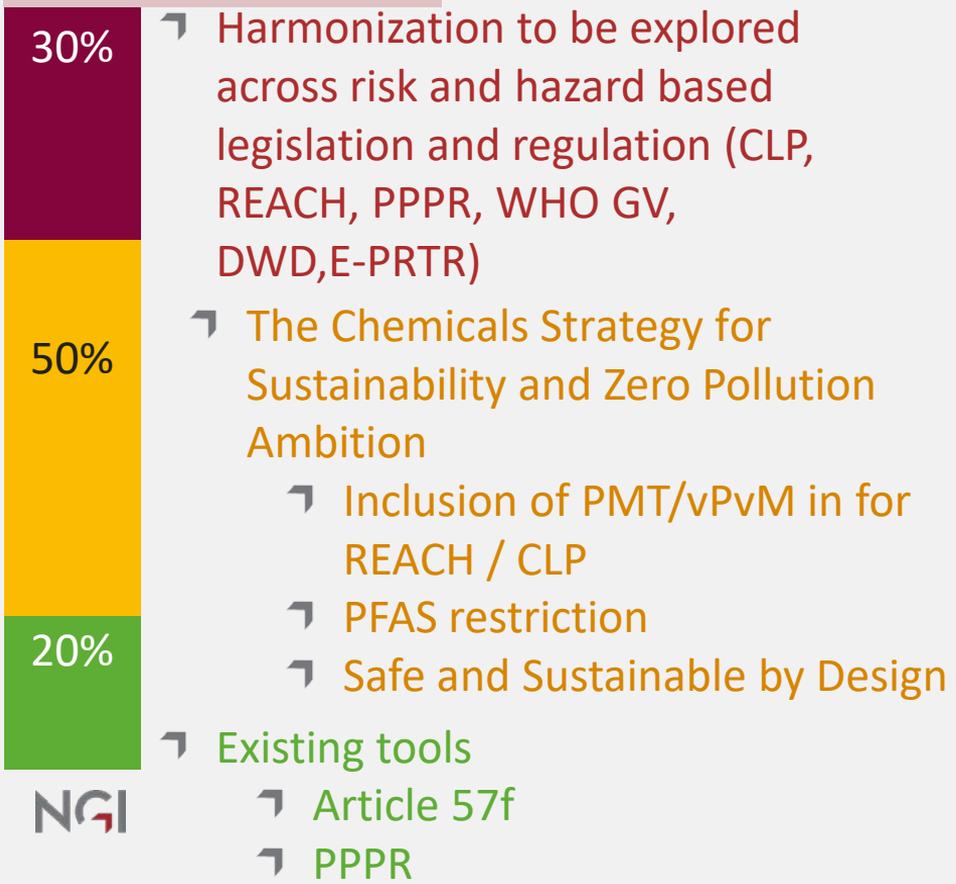


Jin et al. <https://pubs.acs.org/doi/10.1021/acs.est.0c04281>

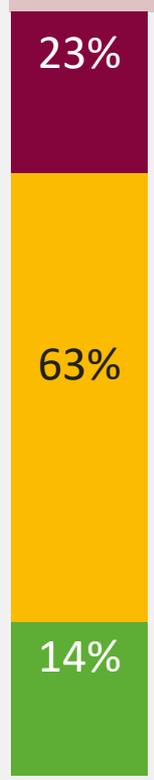


Gap 9: Missing chemical legislation? Results

HPA's prediction



Audience



HPA commentary:
A fairly good prediction. The audience is generally convinced that the CSS and EU Green Deal will do a lot to close the gaps!

Gap 10: Missing safe and sustainable substitutes (rank 4)

HPA's prediction

40%

- Technical / economic challenges
- Definition of «essential use»

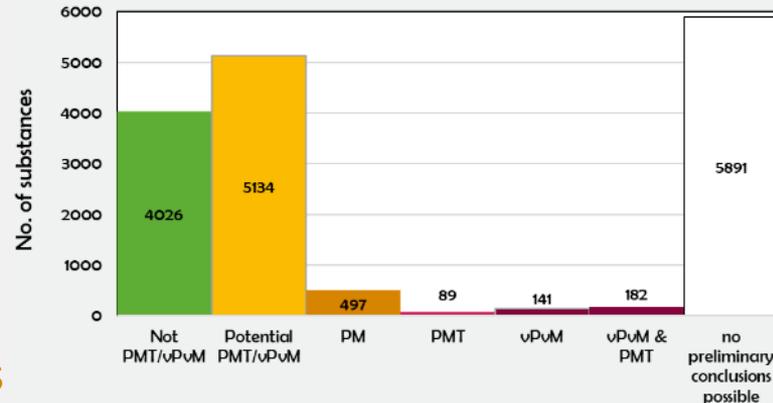
30%

- Safe and sustainable by design / green chemistry techniques concept and techniques rapidly developing
- Sustainable material and process engineering

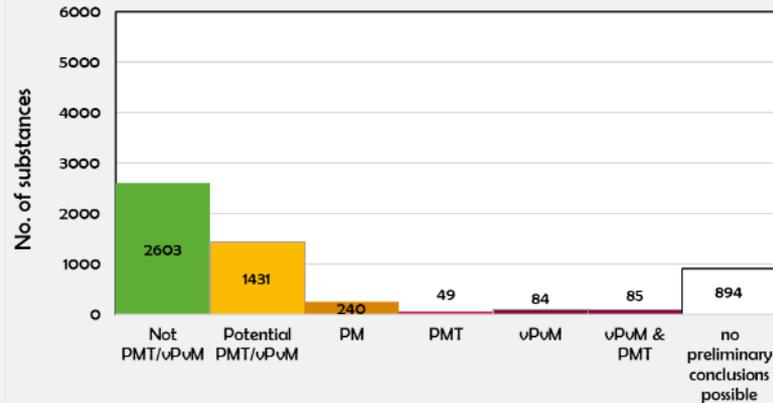
30%

- Majority of high production chemicals are NOT PMT/vPvM
- Strong societal/industry support
- Humans are innovators

A) PMT/vPvM Conclusions for all REACH Registered Substances with identified organic constituent (as of September 2019)

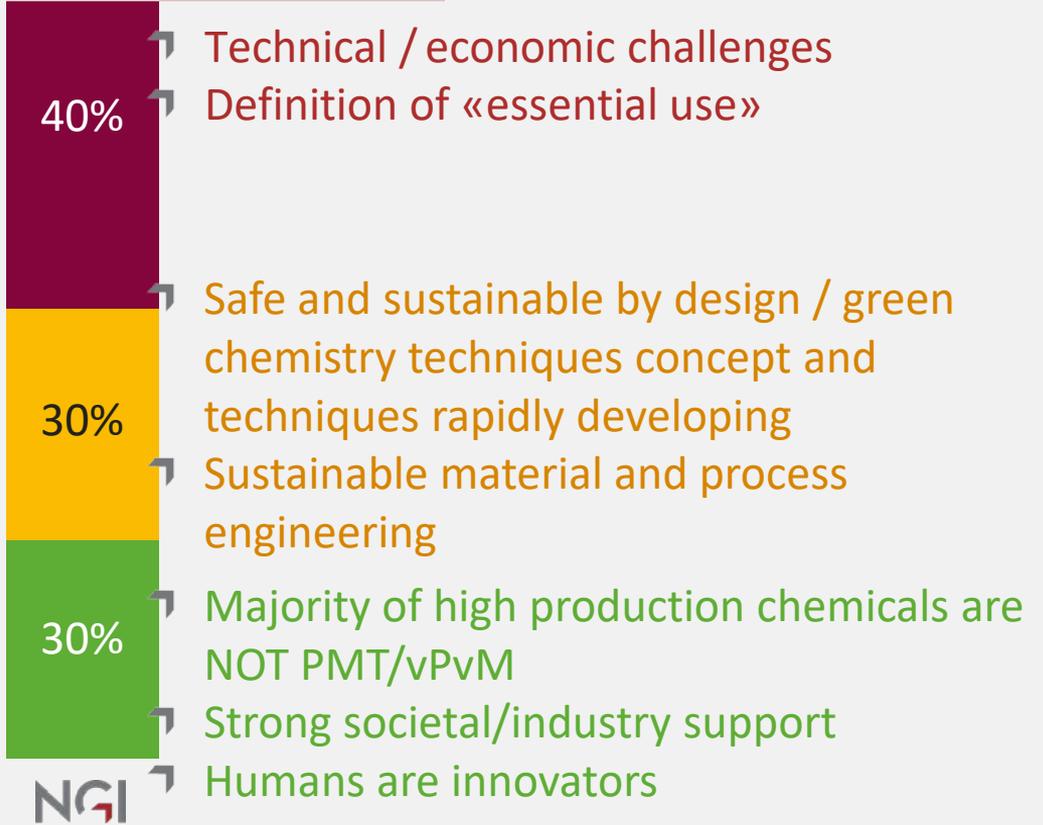


B) For REACH Registered Substances with Organic Constituent > 10 tonnes per annum

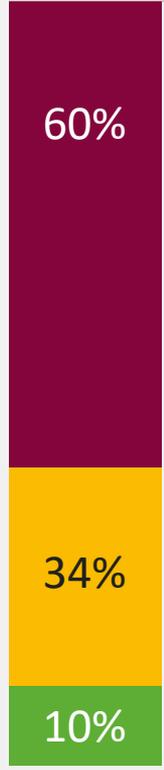


Gap 10: Missing safe and sustainable substitutes (Prediction)

HPA's prediction



Audience



HPA commentary:
A poor prediction, but not a total miss. What I got wrong is assuming more of the audience would think there are easy to find substitutes out there, but what I got right is that this the audience thinks this is a serious gap.

Comparing Poll #1 and Poll #2: Changes in opinions about the biggest gaps over the workshop?

Substance Assessment

- ↗ Availability of Persistency data?
- ↗ Availability of Mobility data?
- ↗ Availability for Toxicity data?
- ↗ Availability of Analytical methods?
- ↗ Availability of Monitoring data?
- ↗ Availability of transformation products and mixture composition?

Risk Governance

- ↗ Missing risk assessment tools/models?
- ↗ Missing water remediation infrastructure?
- ↗ Missing chemical legislation?
- ↗ Missing safe and sustainable substitutes?

	Poll #1	Poll #2
When	Start of workshop	End of workshop
Time	1 hour	20 min
Structure	Top three gaps	Status of each gap: huge, closing, minor
Ranking	Frequency selected in top three	Frequency «huge gap» was selected
N value	Ca 366 of 502 participants	Ca 120 of 340 participants
Notes	<ul style="list-style-type: none">- Definition of «gaps» more clearly defined before Poll #2- Did not control for same participants in both polls.	



Reemtsma et al. ES&T 2016

Comparison of poll ranking of «biggest gaps»

	Beginng of workshop	End of workshop	HPA's End predictions
Availability of trans. prod. and mixture comp	1	1	1
Availability of analytical methods	2	9	9
Availability of monitoring data	3	2	2
Missing safe and sustainable substitutes	4	3	6
Missing risk assessment tools/models	5	8	4
Missing chemical legislation	6	10	8
Availability for toxicity data	7	4	7
Availability of mobility data	8	7	10
Availability of persistency data	9	6	5
Missing water remediation infrastructure	10	5	3

We have the tools, let us close the gaps to get control!

Stewardship + Risk Governance + Science

Non-toxic hierarchy of the
Chemical Strategy for Sustainability

Safe and Sustainable
Chemicals

Minimize and
Control

Eliminate and
remediate



- PMT/vPvM In CLP & REACH
- Harmonization of PMT/vPvM definitions within risk assessment models and regulations
- Big data monitoring data and suspect list harmonization (e.g. non-target in E-PRTR)
- Remediation at emission sources rather than downstream
- Safe and sustainable chemistry

Zero pollution of PM
substances

Status quo





#påsikkergrunn